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10/616,732	07/10/2003	Hitomi Sakurai	S004-5072	2757

7590

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EXAMINER

LUK, OLIVIA T

ART UNIT PAPER NUMBER

2812

DATE MAILED: 04/06/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/616,732

Applicant(s)

SAKURAI, HITOMI

Examiner

Olivia T. Luk

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 05 March 2005.
- 2a) ☒ This action is FINAL. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☒ Claim(s) 2 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. The amendment filed 3/10/05 is objected to under 35 U.S.C. 132 because it introduces new matter into the disclosure. 35 U.S.C. 132 states that no amendment shall introduce new matter into the disclosure of the invention. The added material which is not supported by the original disclosure is as follows: a first gate oxide film 3 **"having a first thickness"** is formed, for example, through thermal oxidation of the silicon substrate and **"the second gate oxide film 6 has a second thickness different from the first thickness"**. In addition, the new claims include the new matter **"forming a MOS capacitor"** and **"wherein the portion of the first silicon oxide film which has not been removed during the removing step comprises an insulating film of the MOS capacitor"**. Lastly, the specification teaches a first gate insulating film 3, but not that it is **silicon oxide**.

Applicant is required to cancel the new matter in the reply to this Office Action.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

3. Claims 1-20 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant

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art that the inventor(s), at the time the application was filed, had possession of the claimed invention. The new matter that is not supported by the original disclosure includes the **"first and second thicknesses", "forming a MOS capacitor", "wherein the portion of the first silicon oxide film which has not been removed during the removing step comprises an insulating film of the MOS capacitor", and "silicon oxide"**.

Claim Objections

4. Claim 2 is objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. Claim 2 has been amended to depend on itself. This is improper.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) and the Intellectual Property and High Technology Technical Amendments Act of 2002 do not apply when the reference is a U.S. patent resulting directly or indirectly from an international application filed before November 29, 2000. Therefore, the prior art date of the

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reference is determined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

6. Claims 1, 3, and 5-14 are rejected under 35 U.S.C. 102(e) as being anticipated by Daniel et al. (6,235,590 B1).

In re claim 1, Daniel et al. discloses forming a first silicon oxide film 36 having a first thickness on a silicon substrate 20 (col. 3, lines 32-35), nitriding the first silicon oxide film so that silicon oxynitride 38 forms at an interface between the silicon substrate and the first silicon oxide film (col. 3, lines 38-60), removing the first silicon oxide film from a part of the silicon substrate using a chemical containing at least an ammonia-hydrogen peroxide solution (standard SC1 clean of ammonium hydroxide, hydrogen peroxide, and water) so that the silicon oxynitride formed at the interface between the part of the silicon substrate and the first silicon oxide film is completely removed (col. 4, lines 5-19), and forming a second silicon oxide film 44 in at least a portion of the part of the silicon substrate from which the first silicon oxide film and the silicon oxynitride have been removed (col. 4, lines 19-30), the second silicon oxide film having a second thickness different from the first thickness (col. 4, lines 36-45).

In re claim 3, Daniel et al. discloses forming a first silicon oxide film 36 having a first thickness on a silicon substrate 20 (col. 3, lines 32-35), nitriding the first silicon oxide film so that silicon oxynitride 38 forms at an interface between the silicon substrate and the first silicon oxide film (col. 3, lines 38-60), removing the first silicon oxide film from a part of the silicon substrate, washing the part of the silicon substrate from which the first silicon oxide film has been removed using a chemical containing at least an ammonia-hydrogen peroxide solution (standard SC1 clean of ammonium hydroxide, hydrogen peroxide, and water) so that the silicon

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oxynitride formed at the interface between the part of the silicon substrate and the first silicon oxide film is completely removed (col. 4, lines 5-19), and forming a second silicon oxide film 44 in at least a portion of the part of the silicon substrate from which the first silicon oxide film and the silicon oxynitride have been removed (col. 4, lines 19-30), the second silicon oxide film having a second thickness different from the first thickness (col. 4, lines 36-45).

In re claim 5, Daniel et al. discloses forming a MOS capacitor on the silicon substrate, and wherein the portion of the first silicon oxide film which has not been removed during the removing step comprises an insulating film of the MOS capacitor (see Fig. 1).

In re claims 6 and 11, Daniel et al. discloses the second silicon oxide film comprises a gate oxide film (col. 4, lines 21-22).

In re claims 7 and 12, Daniel et al. discloses forming a MOS capacitor on the silicon substrate, and wherein the second silicon oxide film comprises an insulating film of the MOS capacitor (see Fig. 1).

In re claims 8 and 13, Daniel et al. discloses the portion of the first silicon oxide film which has not been removed during the removing step comprises a gate oxide film (col. 3, lines 61-66).

In re claims 9 and 14, Daniel et al. discloses forming a MOS capacitor on the silicon substrate, and wherein each of the portion of the first silicon oxide film which has not been removed during the removing step and the second silicon oxide film comprises an insulating film of the MOS capacitor (see Fig. 1).

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. Claims 2, 4, and 15-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Daniel et al. (6,235,590 B1).

In re claims 2, 4, and 19, Daniel et al. discloses the nitriding step includes the step of using an inert gas containing nitrogen (col. 3, lines 40-43), but fails to teach at least an ammonia gas. It would have been obvious to one having ordinary skill in the art at the time the invention was made to have used an ammonia gas for nitriding since it is well known in the art to introduce a gas containing nitrogen and oxygen such as nitrous oxide, nitric oxide, or ammonia.

In re claim 15, Daniel et al. is applied as above in claims 2 and 4, and further discloses forming a first silicon oxide film 36 having a first thickness on a silicon substrate 20 (col. 3, lines 32-35), subjecting the first silicon oxide film to an atmosphere so that silicon oxynitride forms at an interface between the semiconductor substrate and the first silicon oxide film (col. 3, lines 28-45); completely removing the first silicon oxide film and the corresponding silicon oxynitride from a portion of the semiconductor substrate (col. 4, lines 1-19); and forming a second silicon oxide film on the portion of the semiconductor substrate from which the first silicon oxide film and the silicon oxynitride have been completely removed (col. 4, lines 30-45).

In re claims 16 and 18, Daniel et al. is applied as above in claims 2 and 4, and further discloses the removing step comprises a first step of completely removing the first silicon oxide

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film from a part of the silicon substrate, washing the part of the silicon substrate from which the first silicon oxide film has been removed using a chemical containing at least an ammonia-hydrogen peroxide solution (standard SC1 clean of ammonium hydroxide, hydrogen peroxide, and water) so that the silicon oxynitride formed at the interface between the part of the silicon substrate and the first silicon oxide film is completely removed (col. 4, lines 5-19).

In re claim 17, Daniel et al. is applied as above in claims 2 and 4, and further discloses the first step comprises the step of using an hydrofluoric acid to completely remove the first silicon oxide film from the portion of the semiconductor substrate (col. 4, line 12).

In re claim 20, Daniel et al. is applied as above in claims 2 and 4, and further discloses the semiconductor device comprises a MOS transistor; and wherein the first silicon oxide film comprises a gate oxide film of the MOS transistor (see Fig. 1).

Conclusion

9. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event,

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however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Olivia T. Luk whose telephone number is 571-272-1676. The examiner can normally be reached on 8AM to 5PM Mon-Fri.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael S. Lebentritt can be reached on 571-272-1873. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

OTL
March 30, 2005


MICHAEL LEBENTRITT
SUPERVISORY PATENT EXAMINER